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Fishing may achieve its finest value in wilderness and affords a scarce wilderness-dependant experience. Here, an angler casts for cutthroat trout in Montana's Bob Marshall Wilderness Complex.

Cooperation and Controversy in Wilderness Fisheries Management

By John Fraley

ABSTRACT

Fisheries management in U.S. wilderness areas has been limited by a lack of cooperation between state and federal management agencies. Fish and wildlife management guidelines for wilderness areas agreed to in 1986 by the International Association of Fish and Wildlife Agencies, U.S. Forest Service, and U.S. Bureau of Land Management represent a first step but are outdated and too broad to be applied to specific wilderness areas. In addition, they provide no formal process for agencies to work together. New agreements, including the comprehensive framework for managing fish, wildlife, and habitat in Montana's 1.5-million-acre Bob Marshall Wilderness complex, forge close partnerships in managing fisheries and other resources and set specific, shared management guidelines. Despite increased cooperation, many fisheries management issues in wilderness areas remain controversial. These include fish stocking, recreational fishing, ecosystem management principles, control of human use, grazing, and others. Fish stocking creates the most controversy among wilderness managers and the public because of the perceived conflict with wilderness values, potential effects on indigenous aquatic invertebrates and amphibians, and methods of transporting fish to wilderness lakes. Fisheries managers of wilderness areas will benefit as state and federal agencies practice shared rather than divided management of fish, wildlife, and habitat resources. This collaborative approach is consistent with ecosystem management principles, sound science, common sense, and the desires of the public.

Wilderness, like public stewardship of fish and wildlife, is primarily an American concept. Like other natural resource issues, managing fish and wildlife in wilderness areas is the subject of passionate debate. Wilderness fisheries issues are especially controversial because of the significant amount of land designated as wilderness in the United States (approximately 35 million acres, excluding Alaska) (Hendee et al. 1990), the extensive and popular aquatic resources on these lands, differing perceptions about wilderness values, and the emotional value people place on wilderness resources. In this article, I give an overview of some state and federal cooperative approaches to wilderness fisheries management, discuss some fisheries management challenges still to be resolved, and call for increased and more effective agency cooperation to meet these challenges.

Background

Fisheries issues have remained at the forefront of the wilderness management debate for decades. As Hendee et al. point out in their 1990 book, *Wilderness Management*, most recreational use of roadless areas "centers on lakes and streams, particularly high lakes in western mountains" (Hendee et al. 1990:279).

The U.S. Forest Service (FS), National Park Service, Fish and Wildlife Service (FWS), and Bureau of Land Management (BLM) together administer 492 individual wilderness areas totalling 92.2 million acres; two-thirds of these acres lies in Alaska (Hendee et al. 1990). Policies regarding wilderness fisheries management differ among these agencies. In the western United States outside Alaska, the FS administers most wilderness, although traditionally state wildlife agencies have been responsible for fish and wildlife management. To bolster claims for the states' rights to manage wilderness fish and wildlife, state officials often cite Section 4(d)(8) of the 1964 Wilderness Act, which notes, "Nothing in this Act shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to wildlife and fish in the national forests" (Public Law 88-577).

Unfortunately, this division of responsibilities has resulted in inconsistent policies for managing these resources and in frustration by managers and the public. Clearly, there is no logical way to separate management of fish, wildlife, habitat, and visitor use. Fortunately, agencies have begun leaving provincialism behind and are striving for a more cooperative approach.

Cooperative Approaches

In 1986, the FS, BLM, and International Association of Fish and Wildlife Agencies (IAFWA) agreed to guidelines for fish and wildlife management in wilderness areas. These guidelines

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were a first step in the right direction but by necessity were broad because they applied to all FS and BLM wilderness areas; in addition, the agreement did not provide a process by which agencies could work together. Several states, including California, developed memoranda of understanding in cooperation with the FS for various wilderness areas under the guidance of the 1986 agreement, but in most instances debates have continued on the details of management authority.

Many believe the 1986 agreement should be revisited and updated. "These guidelines should be clarified," said Don Duff, national partnership coordinator for the FS and Trout Unlimited. "Some of the wording is confusing and needs to be changed to avoid confrontation and assure a consistent approach by all" (Don Duff, FS and Trout Unlimited, Salt Lake City, Utah, personal communication).

In particular, fish stocking in wilderness lakes has spawned a number of disagreements between some FS managers who believe that stocking compromises the natural character of wilderness and state managers who believe stocking supports a traditional recreational use. Last year Jack Ward Thomas, chief of the FS; Mike Dombeck, director of the BLM; and R. Max Peterson, executive vice president of the IAFWA, issued a letter reaffirming the 1986 agreement and urging agency managers to "work together to meet wilderness and fisheries management objectives whether managing for endangered species recovery, community diversity, or for recreational fishing opportunities" (Thomas et al. 1995). The leaders called on managers to either resolve their differences or elevate the issues for resolution. This directive represents a positive, long-overdue call to end agency bickering.

In March 1995, Thomas issued a follow-up memo to regional foresters across the country in which he reminded them that the responsibility for decisions on stocking fish or wildlife in wilderness areas rests with the state in coordination with the administering agency (FS or BLM). He urged "early and frequent coordination" among the agencies to ensure successful fish and wildlife management. The chief couldn't have made a more clear and direct call for federal and state collaboration.

A Case Study in Wilderness Management Cooperation

One example of an effort consistent with this approach is the 1995 fish, wildlife, and habitat management framework developed by Montana Fish, Wildlife, and Parks (MFWP) and the FS for the Bob Marshall Wilderness complex, a 1.5-million-acre wilderness complex straddling portions of four national forests and three state wildlife agency administrative regions. Adopted in April 1995, the framework aims to make management more consistent, avoid duplicate efforts, and ensure the kind of cooperation the public has called for.

Managers based the framework on (1) shared goals for managing fish, wildlife, and habitat; (2) a common process to resolve management issues; and (3) 1986 IAFWA, BLM, and FS guidelines that were modified, expanded, and updated specifically for the area. During the writing process, managers agreed on four principles:

(1) Both agencies must share in managing all wilderness resources; failure to recognize this principle has been responsible for ineffective management in the past.
(2) Fish, wildlife, and habitat management must be within the guidelines of the Wilderness Act and state wildlife agency and federal agency legal mandates and must follow principles of ecosystem management; beyond that, managers should be flexible. Each wilderness poses unique management challenges, but the general approach and basic management principles can be similar.
(3) Management policies in wilderness areas must have public support or they will not be successful.
(4) The concept of traditional use must be recognized. Citizens have worked to protect the wilderness values present when each area was brought into the wilderness system. Traditional uses such as fishing and hunting create continued public expectations.

Greg Warren, wilderness staff officer for the Flathead National Forest, believes the major difficulty in wilderness management is balancing the concept of traditional use with maintainance of wilderness in a "natural condition," as called for in Section 2(a) of the Wilderness Act. Says Warren, "I hope that when we look back on our wilderness stewardship, we can feel we've strived to preserve the wilderness character mentioned in the Act" (Greg Warren, Flathead National Forest, Kalispell, Montana, personal communication).

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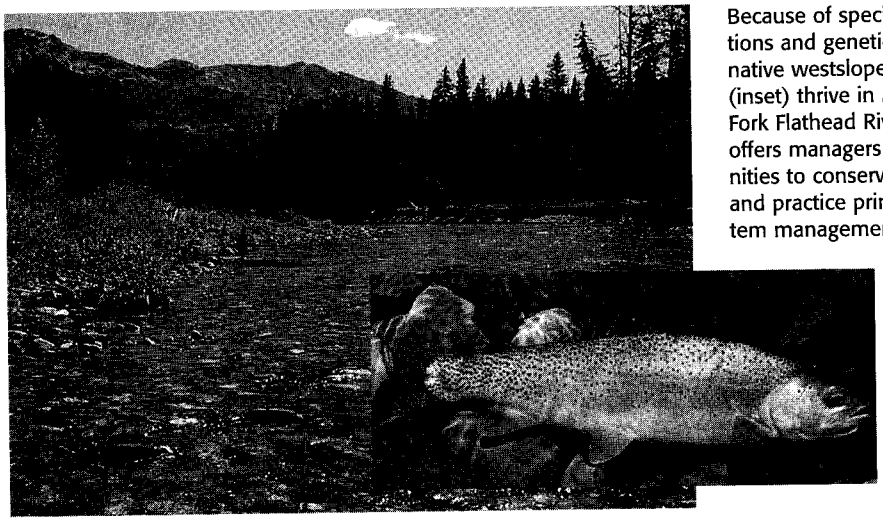
Biologists poison non-native brook trout in a wilderness lake. Managing some wilderness lakes in a fishless condition is gaining support among managers and the public.

During the one-year effort to write the framework, several fisheries issues proved to be most controversial: stocking fish in mountain lakes and fishless lake management, managing humans attracted by fish stocking programs, and managing designated sensitive versus federally listed endangered species. Managers in other states usually find these issues to be the most controversial as well. Hendee and others (1990:279–80) note that fisheries management controversies are consistent across western wilderness areas and include "non-indigenous species, dams to keep streams flowing in summer, fish-spawning facilities, heavy angling, and artificial stocking."

Challenging Issues in Wilderness Fisheries Management

Fish Stocking

Across the western United States, fish stocking represents the most controversial wilderness fisheries management issue (Duff 1995), and recent symposia (i.e., American Fisheries Society Symposium 15 and a followup workshop) have focused on the genetic, ecological, and philosophical issues of fish stocking in wilderness and nonwilderness waters. Fish stocking is



Because of special fishing regulations and genetic managment, native westslope cutthroat trout (inset) thrive in Montana's South Fork Flathead River. Wilderness offers managers special opportunities to conserve native species and practice principles of ecosystem management.

particularly controversial in wilderness areas where motorized use is restricted, yet most fish are still delivered to wilderness lakes via helicopter. In the management framework for the Bob Marshall Wilderness complex (MFWP and FS 1995), managers cited the following reasons for planting fish in wilderness lakes:

(1) Maintaining genetic refuges for sensitive species in high-quality aquatic habitats that lack spawning habitat. This can include fishing recreation as a side benefit.
(2) Supplementing reproduction of a native species in lakes with limited spawning habitat.
(3) Improving the genetics of fish populations and reducing hybridization of native species by continued overplanting of native species in lakes where exotics are present [the so-called "genetic-swamping" technique being used for westslope cutthroat trout (*Oncorhynchus clarki lewisi*) in the Bob Marshall Wilderness complex and adjacent areas].
(4) Providing recreational fishing as part of the wilderness experience.

Managers of wilderness areas usually agree on the first three purposes listed above and debate the fourth, with much of the debate on value judgments. Hendee et. al. (1990:280) note that some people oppose artificial stocking in wilderness lakes because they believe it "distorts the naturalness of the affected aquatic ecosystems, and the use of aircraft for stocking can invade the solitude of visitors." According to Jim Micheaels, a wilderness planner for the Eldorado National Forest's Mokelumne Wilderness in California, "There is still lots of debate internally in the Forest Service on stocking for recreational fishing." He notes that a "variety of viewpoints" exists on how to interpret FS guidelines on fish stocking and that some FS managers believe stocking is incompatible with wilderness objectives (Jim Micheaels, Eldorado National Forest, Placerville, California, personal communication).

Much of the discussion is on interpretation of the 1986 guidelines, which state, "Species of fish traditionally stocked before wilderness designation may be considered indigenous if the species is likely to survive" (IAFWA et al. 1986). Consistent with the Wilderness Act, this acknowledges that fish species do not have to be originally present in an area to be considered indigenous. However, the phrase "likely to survive" is ambiguous. Does it mean "likely to survive and reproduce naturally," as most FS managers contend, or does it mean "likely to survive from fingerling stage to adult size," as many state officials believe? Managers in each wilderness area may approach the issue differently. In the Bob Marshall Wilderness complex, only designated "Species of Special Concern" such as the westslope cutthroat trout, which are native to the area, can be stocked. In other wilderness areas, the stocking program primarily provides recreational fishing for species not originally present in the area.

The use of aircraft to stock fish continues to be the source of much controversy. To support aerial stocking, state wildlife managers refer to Section 4(d)(1) of the Wilderness Act, which says, "Within wilderness areas designated by this Act, the use of aircraft or motorboats, where these uses have already become established, may be permitted to continue...." These managers also note that aerial stocking results in better fish survival, requires little time to complete, and results in less impact to the land than stocking by horse or mule pack train. Others claim that even though the practice is allowed under the Wilderness Act, it conflicts with the two keystone wilderness values of solitude and naturalness. In Washington State, managers have addressed the issue using more primitive methods. State Resource Manager Craig Burley (Washington Department of Fish and Wildlife, Olympia, personal communication) points out that the state maintains an active volunteer program for stocking fish in alpine lakes using horse and backpack transport. This program has reduced controversy associated with stocking wilderness lakes.

Another concern of wilderness managers is the potential effects of fish stocking on indigenous amphibian populations in wilderness lakes. Several studies of mountain lakes in California (e.g., Bradford 1989; Bradford et al. 1993) have shown that some amphibian populations have declined after fish introductions. In discussions about managing wilderness areas in California, FS biologists cite declines in frog populations and suggest that fish stocking is partly responsible (Jim Micheaels, Forest Service, Placerville, California, personal communication). Biologists for California Department of Fish and Game (CDFG) respond that trout have been stocked for more than 40 years, but the decline in amphibians is a more recent phenomenon.

"We recognize that there are many potential causes for declines in the amphibian populations," explained Micheaels, who is coordinating the development of management guidelines for California's Mokelumne Wilderness. "Some of the research done in the Sierra Nevada (Bradford 1989) indicated trout have impacted mountain yellow-legged frog populations." Micheaels believes the issue is not one of "frogs v fish" but rather is broader and relates to human manipulation of animal populations. He cites a recent article in *Scientific American* (Blaustein and Wake 1995) that documents the worldwide decline of amphibians.

"We'd like to examine each lake on a case-by-case basis to identify possible conflicts with amphibians," says Chuck Knutson, senior fishery biologist with the CDFG. Knutson says that his agency has had to defend its authority to stock wilderness

lakes because of amphibian and human use issues. Knutson maintains that the Wilderness Act clearly grants that authority to the states (Chuck Knutson, CDFG, Sacramento, personal communication). In CDFG's Region 2 Policy for Fisheries Management in Wilderness and High Mountain Lakes (1995), Biologist Stafford Lehr cites studies in the Sequoia-Kings Canyon and Yosemite national parks area indicating that introductions of fish have caused the extirpation of the mountain yellow-legged frog (*Rana muscosa*) in certain mountain lakes (Bradford 1989). However, Lehr goes on to write that the yellow-legged frog also has disappeared in some fishless lakes during the same period. He lists UV-B radiation and pesticide drift as other potential causes for the declines, noting that amphibian populations have declined worldwide (Blaustein and Wake 1995).

Mike Stone, fisheries management coordinator for the Wyoming Game and Fish Department, does not believe that fish stocking in wilderness lakes has been a major cause for the decline of amphibians such as the boreal toad (*Bufo boreus*) and wood frog (*Rana sylvatica*). He notes that those who blame stocking programs for the decline are not fully aware of habitat requirements and life cycles of fish and amphibians. "You don't find these frogs in above-timberline areas, in these high granite lakes," said Stone. "It's hard for a frog to make a living up there. Some of these waters have been stocked for 60 years—the amphibian decline has been a recent phenomenon. I think we're seeing some biologists get frustrated about what they can influence and pointing to fish stocking as a scapegoat" (Mike Stone, Wyoming Game and Fish Department, Cheyenne, personal communication).

Managing lakes in a fishless condition in wilderness areas is gaining support among managers and the public. Because of their elevation and lack of access, most lakes in western wilderness areas originally supported aquatic invertebrates and amphibians but no fish (Hendee et al. 1990). Referred to as "barren" in the past, managers now recognize the scientific and aesthetic value of fishless lakes. An issue often debated is whether to plant fishless lakes or whether to eliminate fish in some lakes and return them to their original fishless conditions. Planting fish has established populations in many lakes and changed the natural fauna. This leads to debate about the intent of the Wilderness Act regarding what is "natural," when in time to establish the natural baseline, and what the scientific and aesthetic values are of a lake's condition. Many of these issues are value-laden and can't be resolved objectively. Most managers recognize the value of fishless lakes in maintaining natural fauna, and many lakes have not been planted (Duff 1995). For example, in Montana's Bob Marshall Wilderness approximately three-quarters of all mountain lakes are maintained in a fishless condition (Scott Rumsey, Montana Fish, Wildlife, and Parks, Kalispell, personal communication).

Some managers have argued that planting fishless lakes, especially the original plantings before passage of the Wilderness Act, has been integral to the public's perception of wilderness. In 1976, Richard Stroud, then-executive vice president of the Sport Fishing Institute, argued that fish in wilderness lakes were important for fishing recreation and wildlife viewing. "As the mountain lacking the grizzly becomes just a pile of rocks," he wrote, "so, too, a high-elevation lake without fish becomes just a big puddle. Perhaps in no other aquatic system—owing to extreme water clarity and sharpened human perception—is the visual impact of fish life as important as in high mountain lakes" (Schoenfield and Hendee 1978:133).

Most agreements between state wildlife agencies and the FS tackle management of fishless lakes on a case-by-case basis. The management framework for the Bob Marshall Wilderness calls for no further stocking of fishless lakes until a comprehensive lake management plan is developed for all area lakes. State and federal managers are pursuing a similar approach in California wilderness areas in the Sierra Nevada Range. Several managers have argued that some lakes should be rendered fishless to restore a natural condition that had been affected by humans. In one of the few examples of its kind, fisheries managers in the Bob Marshall Wilderness complex applied rotenone to remove nonnative brook trout in Devine Lake, a small pothole in the headwaters of Youngs Creek in the South Fork of the Flathead Drainage. The action sought to remove the threat of brook trout (*Salvelinus fontinalis*) interbreeding with bull trout (*S. confluentus*), a designated, indigenous species of special concern that resides in the drainage downstream. The public supported the project because of its benefit to the bull trout population. However, it is unclear if the public would have supported the action strictly to return the lake to its natural, fishless condition, or if the lake had been a large, popular fishery. Public input will help managers determine future management of the lake.

...across the western United States, many visitors report that fishing is an important part of their wilderness experience, enhancing other satisfactions such as observation of aquatic life or photography

In other areas, proposals to remove nonnative fish have met resistance. In Idaho, the Department of Fish and Game forwarded a proposal to remove a stunted, self-sustaining brook trout population from a wilderness lake and to improve the fishery by stocking a native fish species. When the proposal met resistance by some members of the public, it was dropped.

"This points out a lot of confusion," says Fisheries Manager Dexter Pitman. "A lot of people haven't thought through the social and biological issues. The brook trout were there because of human action, but some people don't wish to take action to remove them, even if the lake would be left fishless" (Dexter Pitman, Idaho Department of Fish and Game, Boise, personal communication).

Recreational Fishing and Managing Human Use

Is recreational fishing consistent with the Wilderness Act and agency management guidelines? Many sources indicate that it is. Most managers agree that wilderness management should favor wilderness-dependent activities. As Hendee et al. (1990) point out, "...although people can fish in a wide variety of settings, certain styles of fishing may be wilderness-dependent. Those who desire remote, difficult-to-reach lakes where one can fish under natural conditions without meeting other people may rely on wilderness for such opportunities." In wilderness areas across the western United States, many visitors report that fishing is an important part

of their wilderness experience, enhancing other satisfactions such as observation of aquatic life or photography. Schoenfield and Hendee in their 1978 book, *Wildlife Management in Wilderness*, note, "Fishing is a traditional recreational activity in most wildernesses, and its status under the direction of state fish and wildlife agencies is reaffirmed by the Wilderness Act. Fishing can achieve its finest quality in wilderness, can be a scarce wilderness-dependent experience, and can be a means by which many recreationists obtain wilderness values" (Schoenfield and Hendee 1978:130). They go on to point out that fishing is a traditional use of wilderness and that a reasonable goal for fisheries management in wilderness is to provide fishing opportunities consistent with wilderness values.

As Hendee et al. (1990:279) conclude, "Clearly, fishing on wilderness waters is an important activity for many visitors. And for many, fishing, like hunting, can achieve its finest quality in wilderness....Wilderness is a place where one can indulge in the primitive myth that one can live off the land." This recreational fishing philosophy of the Wyoming Game and Fish Department is consistent with that of Montana and other states across the West. "When you are going to a wilderness lake, you shouldn't expect to fill your creel each time," says Fisheries Management Coordinator Mike Stone. "We're trying to educate people that these high lakes can't sustain large harvests; that's not what it's really all about up there" (Mike Stone, Wyoming Game and Fish Department, Cheyenne, personal communication).

In western wilderness areas, managers have suggested that fish stocking should be halted or reduced at some lakes because of impacts associated with the use these fish attract. But once examined, the issue becomes much more complex. Managers often debate the merits of visitor management, trail maintenance, fishing regulations, and stocking rates versus damage control along the shorelines of wilderness lakes and the trails leading to them. Many managers would like to see a combination of techniques used (MFWP and FS 1995). Indeed, there are disadvantages to controlling impacts at selected lakes by halting fish planting. For example, curtailing fish planting at some lakes could concentrate use on the remaining lakes with fish and may not decrease use significantly if the lake is located along a popular trail; this illustrates the need for multiple approaches to control harmful impacts.

Hendee et al. (1990) identify the dangers of trying to manipulate wilderness-lake fisheries to manage human use and impact. They note that studies of use at Washington's Alpine Lakes Wilderness indicated that approximately 40% of lake visitors actually fished; they fished for an average of less than 2 hours per day; and 40% of them caught no fish. They also found that nonanglers spent just as much time at the lakeshore as anglers. In addition, the authors referred to other studies that showed fewer than 50% of visitors to high lakes actually fish. "Any policy designed to relocate western wilderness visitors by regulating fishing can affect only a portion of total use," they concluded (Hendee et al. 1990:279).

Wilderness and Ecosystem Management

Wilderness offers fisheries managers a special opportunity to practice the concepts of ecosystem management such as paying attention to ecosystem integrity and the role of humans, and viewing management in terms of the biological community rather than of individual species (Salwasser 1994). The ecosystem approach to wilderness fisheries management also could include taking special care of sensitive species (state species of special concern or species on the FS's sensitive species list) in addition to legally mandated endangered or threatened species and their habitat. Ecosystem management principles can be controversial when applied to wilderness management because they can involve waters and lands outside the designated wilderness boundary (MFWP and FS 1995). According to Aquatic Ecologist Don Duff, recovering sensitive species in wilderness makes sense for the species and the public's view of agency management. "It shows the public that objectives for fisheries management and wilderness management can be compatible," he said (Don Duff, FS and Trout Unlimited, Salt Lake City, Utah, personal communication).

Voluntary conservation strategies may preclude the need for federal listing of sensitive species and the complex legal mandates that go along with it. Because of the nature of wilderness, where many of the original ecosystem components still remain, managers have the opportunity to lead the way in this approach.

Other Issues

Challenging issues fisheries managers face in some wilderness areas include livestock grazing. According to Kevin Stubbs of the U.S. Fish and Wildlife Service (FWS), livestock grazing has been a particularly difficult issue in California's wilderness areas (Kevin Stubbs, FWS, East Lansing, Michigan, personal communication). Calling the problem "widespread," Stubbs, who worked with the FS in California on Endangered Species Act consultations, said that overgrazing has degraded many wilderness streams that support native fish. Grazing agreements are expensive to administer and difficult to monitor, he explains. "It would be a lot cheaper to get rid of grazing and remove the fencing intended to protect riparian areas," says Stubbs. "To monitor these allotments properly, someone would have to ride in on horseback and camp out for a week. Usually, by the time the areas are checked, the damage has already been done."

Another issue managers often find controversial is construction of fish barriers to preclude invasion of nonnative fish species into wilderness streams that support indigenous fish species. On the South Fork of the Kern River in California, biologists constructed a series of barriers within a wilderness area to prevent brown trout from entering stream sections supporting indigenous golden trout (*Oncorhynchus aguabonita*). The biologists also applied rotenone to the lowest stream section to remove brown trout (Steve Parmenter, CDFG, Bishop, personal communication). This kind of project can be controversial because while it seeks to maintain a native species, it uses invasive methods that many consider inappropriate in wilderness.

A host of other challenges face managers of wilderness fisheries as well, including setting fishing regulations consistent with wilderness principles, employing fish sampling techniques such as electrofishing, monitoring fish populations in wilderness areas, and lacking data on which to base management decisions. Only through continued and increased cooperation can state and federal managers address these issues effectively.

Conclusion

The need for consistency in wilderness management was a major rationale for the passage of the 1964 Wilderness Act.

Many believe that the act, and other legislation that followed, clearly mandated state and federal cooperation in managing fish and wildlife in wilderness areas. The 1986 agreement (IAFWA et al. 1986) between federal and state fish and wildlife agencies continued the call for cooperation but still fell short of calling for the kind of shared authority needed for effective management. More recent individual agreements between states and national forests, like the management framework for the Bob Marshall Wilderness complex, have moved us closer to this goal, but we are not there yet. "The public sees the inherent conflict in current agency management policies," explains Don Duff (1995). "Agencies must jointly reevaluate their policies in order to assure maintenance of wilderness aquatic ecosystems while at the same time providing for reasonable wilderness recreational fishing opportunities."

During public involvement processes throughout the past decade on management of the Bob Marshall Wilderness complex, people recognized the futility of separately managing land, visitors, fish, and wildlife. Wilderness users like outfitters, backpackers, hunters, and anglers called for state and federal managers to rise above the bureaucracy and egos, work together, and share responsibility for managing all wilderness resources. As leaders of state and federal agencies involved in wilderness management wrote (Thomas et al. 1995:1), this cooperative approach is "consistent with ecosystem management principles, with sound science, and with common sense." Now is the time to heed their call.

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References

Bradford, D. F. 1989. Allotopic distribution of native frog and introduced fishes in high Sierra Nevada lakes of California: implication of the negative effect of fish introductions. Copeia 1989 (3):775–778.

Bradford, D. F., F. Tabatabai, and **D. M. Graber.** 1993. Isolation of remaining populations of the native frog, *Rana muscosa*, by introduced fish in Sequoia and Kings Canyon national parks, California. Conserv. Biol. 7(4):882–888.

Blaustein, A. R., and **D. B. Wake.** 1995. The puzzle of declining amphibian populations. Sci. Am. 272 (4):52–57.

CDFG (California Department of Fish and Game). 1995. Region 2 policy for fisheries management in wilderness and high mountain lakes. Sacramento, CA.

Duff, D. A. 1995. Fish stocking in U.S. federal wilderness areas—challenges and opportunities. International Journal of Wilderness Management 1 (1):17–19.

Hendee, J. C., G. H. Stankey, and **R. C. Lucas.** 1990. Wilderness management (contains the complete text of the 1964 Wilderness Act). North American Press, Fulcrum Publishing, Golden, CO.

IAFWA (International Association of Fish and Wildlife Agencies), FS (U.S. Forest Service), and **BLM (U.S. Bureau of Land Management).** 1986. Policies and guidelines for fish and wildlife management in national forest and Bureau of Land Management wildernesses. Interagency agreement between IAFWA, FS, and BLM, Washington, DC.

MFWP (Montana Fish, Wildlife, and Parks) and **FS (U.S. Forest Service).** 1995. Fish, wildlife, and habitat framework for the Bob Marshall Wilderness Complex. Interagency agreement between MFWP and FS, Kalispell, MT.

Salwasser, H. 1994. Ecosystem management: Can it sustain diversity and productivity? J. For. 92(8):6–10.

Schramm, H. L., and **R. G. Piper,** eds. 1995. Uses and effects of cultured fishes in aquatic ecosystems. American Fisheries Society Symposium 15.

Thomas, J. W., M Dombeck, and **R. M. Peterson.** 1995. Letter (23 February 1995) regarding wilderness fish and wildlife management to regional foresters, state directors, and state government members of the International Association of Fish and Wildlife Agencies, Washington, DC.

Thomas, J. W. 1995. Interagency followup memo from Thomas to regional foresters, 8 March 1995. FS, Washington, DC.

Schoenfeld, C. A., and **J. C. Hendee.** 1978. Wildlife management in wilderness. The Boxwood Press, Pacific Grove, CA.